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EOSDIS Core System Project

6A Science System Release Plan for the ECS Project

April 2001

Raytheon Company
Upper Marlboro, Maryland

6A Science System Release Plan for the ECS Project

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

This document is the 6A Science System Release Plan for the ECS project. It documents the ECS approach for completing the development of the SDPS Release 6A system. It differs from the previous three versions by describing modifications to release capabilities mapped to 6A turnovers, and other changes and modifications as a result of 6A and post 6A re-planning. In addition, Release 5BP capabilities, implemented in parallel with Release 6A and incorporated in the release, are included herein as they were not addressed in the 5B SSRP.

Keywords: Release 6A, Release 5BP

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1. Introduction

1.1 Identification

This document is the fourth and final version of the 6A Science System Release Plan for the ECS project, which is defined by Data Item Description (DID) 334/DV1.

1.2 Scope

The 6A Science System Release Plan documents the definition, implementation, and development of the ECS SDPS Release 6A system. The scope of this plan covers 6A and 5BP releases and covers the following items:

a. Capabilities to be developed

b. F&PRS requirements to be delivered

c. Approach to be used for NCR fixes and any known high priority NCRs planned to be delivered

d. Overall strategy for COTS upgrade

e. Build and drop/patch approach and known/scheduled drop/patch information

f. Customer reviews to be conducted

g. CDRLs to be delivered and/or updated

h. Approach to be used for requirements verification (test approach)

i. Schedule of key activities

j. Progress metrics

k. Risk mitigation plans and external drivers

Mod 86, the ECS Restructure Proposal for Contract NAS5-60000 provides the basis for this plan. This plan and the associated schedule will be revised, as required, based on the negotiations.

1.3 Purpose

The 6A Science System Release Plan (SSRP) for the ECS Project documents the ECS approach for releasing the 6A Science System. This plan describes: the capabilities to be addressed by 6A (including 5BP); the process for defining requirements, designing, developing, integrating, verifying, reviewing, monitoring, and statusing all products defined under the Restructure Proposal for 6A; and the known issues and risks.

The purpose of this plan is to document the approach for and the road map to the release of the 6A system. This has been a working plan and, as was necessary, it was updated to reflect the latest approved changes up to CSR. This document is designed to complement the existing management tools such as Primavera.

1.4 Status and Schedule

This document provides the ECS plan for 6A as of the 6A Consent to Ship Review (CSR). It is intended to capture the final 6A system as approved for shipment to the field.

1.5 Document Organization

Section 2 provides the related documentation. Section 3 responds to the specific CDRL requirements.

2. Related Documentation

2.1 Parent Documents

Parent documents are documents from which the Science System Release Plan's scope and content are derived.

803-RD-025	Mod 86, The ECS Restructure Proposal for Contract NAS5-60000
423-41-01	ECS Statement of Work
423-41-02	Functional and Performance Requirement Specification for the Earth Observing System Data and Information System (EOSDIS) Core System
ECS 999-TR-951-024R	NAS5-60000, Delivery Schedule

2.2 Applicable Documents

The following documents are referenced within this Science System Release Plan or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

308-CD-001	ECS SDPS Software Development Plan (SDP)
335-CD-002	ECS COTS Deployment Plan, Volume 2
223-TP-001-001	Transition Plan 5B TO 6A for the ECS Project, Technical Paper

2.3 Information Documents

2.3.1 Information Documents Referenced

None

2.3.2 Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document. These documents are not binding on the content of this volume.

None

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3. 6A System Development and Release

3.1 Overview

This plan governs development of the 6A system release. This section first summarizes the principal functionality and performance additions to ECS for this release and then describes the capabilities to be developed, identifies requirements to be verified, and the approach for grouping of requirements in support of Ticket generation. It summarizes the development and test approach.

Functionally, there are several new features and capabilities:

- Distribution – the ability to write files to two additional kinds of media (CDs, DVDs and DLTs), and the ability to perform data compression.
- User functionality – providing access to non-science granules, augmenting the subscription service with FTP pull capability, and updating the Science Data Server to handle service requests in priority order.
- System functionality – providing a script-based operator interface to delete data products out of the archive; and providing a machine-to-machine search and order interface for SIPS (as opposed to user logon through the Version 0 client).

Performance requirements must also be met. This includes the ability to meet the performance requirements for Aqua processing (5B only supports SSI&T); and Terra re-processing, essentially doubling the Terra processing levels. In addition, there are modifications to the Science Data Server to handle the 6A workload, and to the Data Processing System to handle the scheduling of a larger number of PGEs.

At the direction of ESDIS, the support of ASF and ORNL has been removed from the ECS baseline. Therefore, activities related to these sites and the references to the ASF and ORNL have been removed from this document.

Several capabilities previously earmarked for 6A have been deferred for future patches; likewise two capabilities have been incorporated into the Product Distribution System (PDS) with ECS.

3.2 Requirements

3.2.1 Mission Requirements

The missions supported by Release 6A are shown in Table 3.2.1-1. Additionally, the new interfaces supported by Release 6A are provided in Table 3.2.1-2

Table 3.2.1-1. Releases 6A Launch Highlights

Satellite	Launch Date	SSI&T	Operations Version	6A Performance Capabilities
Landsat-7	15-Apr-99	N/A	4 or later	Full Ingest & Archive
Terra	18-Dec-99	4 or later	4 or later	Processing (1X), Reprocessing (1X)
Meteor/SAGE III	TBD	SIPS I/F Testing	4 or later	Full Ingest & Archive for Processing and Reprocessing
FOO/ACRIM	20-Dec-99	SIPS I/F Testing	5A or later	Full Ingest & Archive for Processing and Reprocessing
Aqua	No earlier than July '01	5B	6A	Processing (1X for Level 1 and .5x for higher level)
ICESat GLAS	30-Jul-01	SIPS I/F Testing	6A	Ingest and archive for 1X processing

Table 3.2.1-2. New Interfaces Supported by Release 6A

Interface	**Data Flow**	**Documentation**	**Satellite**
ECS-SIPS Machine to Machine	Archived Data for Reprocessing	SIPS ICD, Vol. 0 , Update, ECS	N/A
ECS-ICESAT	ICESAT L0 & Higher-Level	New SIPS ICD, ESDIS	ICESAT GLAS
ECS-V0	Search & Order messages, non-science data	ECS-V0 ICD, Update, ECS	N/A

3.2.2 ESDT Requirements

Table 3.2.2-1 provides the number of ESDTs planned to be developed for Release 6A or during Release 6A development period.

Table 3.2.2-1. New ESDTs

Instrument	**Number of new ESDTs**
ICESAT GLAS	33
EMOS	11
MODIS PM-1	647 (delivered as a patch to 5B)
Total	**692**

3.2.3 Capacity Requirements

Table 3.2.3-1 provides the capacity requirements for 6A. Note: Baselined Capacities are provided for the end of 2001.

Table 3.2.3-1. 6A Capacity Requirements

	Archive Volumes (GB/Day)	# of Granules (#/Day)	Processing Power (MFLOPS)	
EDC	750	11428	1650	
GSFC	1332	9791	6401	
LaRC	328	3223	9683	
NSIDC	60	2588	100	
	Archive Volumes Cumulative (TB)	**# of Granules (000s)**	**Distribution**	
			(GB/Day)	**Tape (GB/Day)**
EDC	504	6200	278	243
GSFC	748	5338	521	521
LaRC	241	2212	104	104
NSIDC	26	1158	20	20

3.2.4 Release Capability Requirements

Release 6A is being developed based on a set of Release Capabilities (RC's). These RC's are defined in support of operational readiness for new missions and enhancement of existing capabilities in use by operations. In addition, several RC's were developed as patches to the 5B release and identified as 5BP capabilities. The following paragraphs provide RC's and their summary description for 5BP, and those in the core 6A release. RC's which have been deferred from the core 6A release or superseded by the development of the PDS are also identified

3.2.4.1 Release 5BP Capability Requirements

1. **URLs for Data Set Disclaimer, User Guide, and Miscellaneous Information**. Release 5BP capability to provide science users additional information which includes the URLs for data set disclaimer, data set users' guide and other miscellaneous data set specific information, whenever an inventory search request is made via the VO EOS Data Gateway.

2. **Seamless User Registration**. Users of ECS and V0 will be provided with a single interface for creating and updating V0 and ECS user accounts. The V0 EOS Data Gateway (EDG) is the client from which science users access ECS data and services as well as the legacy Version 0 data systems. The V0 EDG Client will replace the current User Registration Tool. Each registered user will have a unique user ID and a password, which will allow access to both V0 and ECS systems from their Home DAAC as well as from any other DAAC.

3. **L7 Pricing Algorithm**. This capability will provide the ECS support required to generate a price estimate for LANDSAT-7 (L7) product orders received from EDG clients through the VO Gateway. This is limited to the functionality required to prepare the price estimate based on the customer order.

4. **NCEP AVN Product Ingest**. This capability will provide the ECS support required to ingest the NCEP 1-Degree Aviation Model data required for AIRS processing.

5. **DPREP Processing of Carry-Out File Data for Aqua**. This adds processing for Aqua orbit data received from EDF in definitive orbit data files. GBAD data is extracted from the Aqua telemetry stream by EMOS and formatted into carry-out files that are then transmitted to ECS for DPREP processing. This data is used, together with definitive orbit data to produce refined attitude data.

6. **NCEP PREPQC Data Ingest**. This provides the ECS support required to ingest the NCEP PREPQC data required for AIRS processing. The NCEP PREPQC data is produced by NOAA in the BUFR format and is accessible to ECS through the Lary server at the GSFC DAAC.

7. **NCEP PREPQC Data Conversion**. This provides the ECS support required to convert the NCEP PREPQC data required for AIRS processing from the native BUFR format to the HDF-EOS standard used within EOS. The data must be converted to the HDF-EOS point format before the AIRS PGEs can use it.

8. **Support for AIRS Summary Browse Products**. This will allow the AIRS team to be able to identify content features in order to specify geographic search criteria. A larger AIRS Global Summary Browse (ASBP) product will be created which will be stored as their own datasets (collections).

3.2.4.2 Core Release 6A Capability Requirements

1. **Reprocessing**. Release 6A will support the regeneration of products that were previously produced and archived. The upgraded products will be archived in addition to the versions that were previously archived. The reprocessing load for 6A will be one times that of standard production.

2. **System Throughput**. Changes will be made in Release 6A to support the increasing requirements of Terra instruments and the new requirements for Aqua instruments with regard to ingest, production, storage, and distribution.

3. **V0 Gateway Enhancements**. ECS will provide access to collections that are not considered to be science data collections. These requests would come through the V0 Gateway from the V0 Web Gateway. This includes the capability to limit the number of attributes and their values associated with granules that are sent from the V0 to ECS Gateway back to the V0 Web Client as part of an INVENTORY_RESULT message.

4. **FTP Pull Subscriptions**. Release 6A will support subscription acquires via FTP pull.

5. **Machine-to-Machine Gateway**. ECS will provide a SIPS/ECS gateway. The gateway will accept data orders from a SIPS via TCP/IP sockets in ASCII, specifying the data type, spatial and/or temporal qualification, and other qualifications. The gateway will submit the corresponding search request into ECS, and order the resulting granules for ftp-push or media from ECS.

6. **Granule Deletion**. Release 6A will provide a mechanism for operators to delete data products.

7. **Archive Improvements**. ECS will make changes to improve the operation of the archive.

Raw data about data access and staging activity will be provided to allow the system to be tuned for more optimum loading. Logical Archive ID functionality will be upgraded so that the Science Data Server will not have to know which Archive Server stores each type of granule. This will allow for complete separation of location references stored by the Science Data Server from the physical location of the file on tape. It will also allow data from a single version of a collection to be allocated across instances of the archive for load balancing. To improve scalability, Storage Management Servers will be changed to use native operating system threads instead of DCE threads. In addition, these servers will be upgraded to support parallel AMASS file inserts and retrieves.

8. **Ingest of 6A Data Types**. The SIPS interface will be used to ingest GLAS and EMOS Historical Data files.

9. **EDC Processing of DPR Attached to a DAR**. In 6A, ECS will provide the additional capability for a user to specify a data processing request (DPR) associated with the submittal of an ASTER Data Acquisition Request (DAR). When the Level 1B product requested by the DAR is ingested, the associated DPR will automatically be submitted for processing at the EDC DAAC. Attached DPRs are only supported for ECS generated products.

10. **Landsat-7 Granule Deletion**. This capability enhances the deletion utility that can be used from the command line to delete ECS granules, to handle physical deletion of Landsat granules.

3.2.4.3 Release 6A Capability Requirements Incorporated via PDS

1. **Additional Media Types**. Support for writing files to CD-ROMs and DLT tape drives for distribution will be added for Release 6A. This capability is being provided via the PDS system.

2. **Multi-Host Scheduling**. Archive and distribution request management will be upgraded. Enhancements include: the ability to manage the same device types across multiple distribution servers; the ability to utilize multiple devices concurrently in the fulfillment of a distribution request; and additional support for fault recovery and request failover. This capability is being provided via the PDS system.

3. **Integration of the EDC Product Distribution System (PDS) with ECS.** This provides changes in the support for additional physical media types by ECS. The EDC PDS is considered an operational DAAC extension of the ECS and the intent is to use the PDS for all physical media distributions as an interim change pending future implementations by ECS.

3.2.4.4 Release 6A Capability Requirements Deferred

1. **Compression for Distribution**. Two types of compression, Unix and Gzip, will be supported for the distribution of data.

2. **EDOS Backup**. Distribution requests on D3 tape will be supported in order to provide replacement data to EDOS for backup and ECS will be able to request data from EDOS and ingest replacement data.

3. **Tape Ingest of IGS Browse/Metadata**. A future release will add the capability to ingest IGS Format 0 (combined F1/F2) metadata and browse data from 8mm tape.

3.2.5 Requirements & Criteria for System Verification Development

The F&PRS contains all of the Level 3 (L3) requirements that are to be developed by ECS. The allocation of 6A L3 requirements and requirement interpretations are provided in Appendix B. Additionally, IRDs provide the external interface requirements for ECS. The list of 6A IRDs is also included in Appendix B. This section defines the process for further analysis of these requirements and generation of tickets.

Initially, Systems Engineering allocates L3 requirements to RC's, maps IRD's to L3's, and develops operations concept. Systems Engineering then performs a detailed requirements analysis which includes working with Development to derive 6A Level 4 (L4) requirements from the current L3 requirements. These L4 requirements are mapped to the 6A L3 and IRD requirements. Additionally, Systems Engineering generates a set of verification tickets. These verification tickets are structured to group requirements (L3's, IRD's, and L4's) for logical testing and establish a complete set of Acceptance Criteria (AC) against which test cases should be evaluated to verify that these groupings of requirements are satisfied by the system. When all of the Acceptance Criteria in a ticket are verified, the ticket and its associated requirements are considered verified by association. The process for reviewing and approving requirements and tickets is the same as process explained in the 5B SSRP document.

The Table 3.2.5-1 provides the mapping of Release 5BP Capabilities to Tickets.

Table 3.2.5-1. Mapping of Release 5BP Capabilities to Tickets

Ticket ID	Ticket Title
EN_BP_01	URLs for Data Set Disclaimer, User Guide, and Miscellaneous Information
EN_BP_02	Seamless User Registration Between ECS and V0
EN_BP_03	Support for AIRS Summary Browse Products
RH_BP_01	L7 Pricing Algorithm Update
RH_BP_02	NCEP AVN Product Ingest
RH_BP_04	DPREP Processing of Carry-Out File Data for Aqua
RH_BP_05	NCEP PREPQC Data Ingest
RH_BP_06	NCEP PREPQC Data Conversion
RH_BP_07	GLAS and AMSR NOSE Support

The Table 3.2.5-2 provides the mapping of core Release 6A Capabilities to Tickets.

Table 3.2.5-2. Mapping of Core Release 6A Capabilities to Tickets

Ticket ID	Ticket Title
EN_6A_02	V0 Gateway Enhancements (non-science collections; result set attributes)
EN_6A_04	Granule Deletion
RM_6A_01	Reprocessing
RM_6A_04	FTP Pull Subscriptions
RM_6A_05	Machine-to-Machine Gateway
RM_6A_07	EDC processing DPR Attached to a DAR
RM_6A_08	Landsat-7 Granule Deletion
RS_6A_05	Archive Improvements (Logical Archive ID, Priorities, Logging, GUI changes)
RS_6A_06	Ingest of 6A Data Types
SL_6A_01	GSFC 24-Hour Workload Performance
SL-6A_02	EDC 24-Hour Workload Performance

The Table 3.2.5-3 provides the mapping of PDS 6A Release Capabilities to Tickets.

Table 3.2.5-3. Mapping of Release PDS 6A Capabilities to Tickets

Ticket ID	Ticket Title
RS_6A_01	Additional Media Types (CD-ROM, DLT)
RS_6A_04	Multi-Host Scheduling (Request Manager, Multiple Media Servers, FH&R, Priority Handling,)
RM_5X_01 RM_6A_09	Integration of the EDC Product Distribution System (PDS) with ECS

The Table 3.2.5-4 provides the mapping of deferred 6A Release Capabilities to Tickets.

Table 3.2.5-4. Mapping of Release Deferred 6A Capabilities to Tickets

Ticket ID	Ticket Title
EN_6A_01	Tape Ingest of IGS Browse data and Metadata
RS_6A_02	Compression for Distribution (gzip, compress)
RS_6A_03	EDOS Backup

3.3 Software Design, Development, and Integration

The ECS SDPS Software Development Plan (SDP), DID 308-CD-001-008, defines the steps by which the development of ECS SDPS software will be accomplished and the management approach to software development. The SDP addresses software processes, methods, organizational responsibilities, tools, configuration management, software quality, and other activities relevant to accomplishment of the ECS SDPS statement of work. This document is periodically reviewed and if necessary updated for each release. ECS software development is based on a set of Development Capabilities. The Development Capabilities are derived from Release Capabilities.

Development of each capability involves activities that follow a waterfall life cycle as shown in Figure 3.3-1. Each phase of development (Requirements, Preliminary Design, Detailed Design, Code, Unit Test, and Integration) consists of an activity, followed by a peer review (the milestone shown in the figure) of the outputs, and a workoff period for any issues discovered during the peer review. Each of the phases has a set of required artifacts (shown underneath the milestones) that are specified in Development Program Instructions. All of the activities shown are scheduled and maintained in Primavera as part of the overall system schedule.

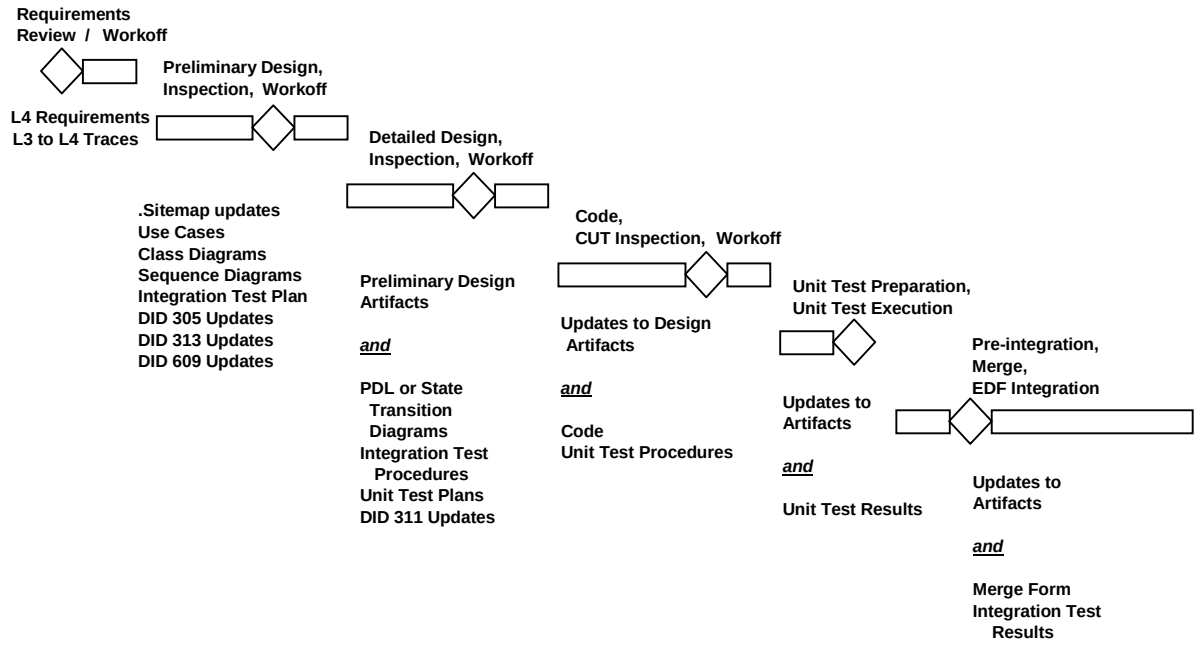

Figure 3.3-1. Capability Development and Integration Approach

At or soon after IRR, Development provides a draft Integration Test Plan, as well as drafts of the updated versions of DIDs 305, 313, and 609, in order to ensure that there is a broad understanding of the functionality to be delivered in the release. The Integration Plan, identifies the development capabilities to be designed and coded for the L4 requirements; how these capabilities will be tested and the associated test criteria; the integration test plan for each capability; and how the integration will be managed (i.e., what will be integrated in what order).

ECS has provided the 6A custom software to the Test Engineering in series of turnovers. The implemented Acceptance Criteria for some Release Capabilities were spread between Turnover 1 through Turnover 3. Turnover 4 provides a wrap-up of NCR fixes. The 6A system will culminate in the CSR scheduled for March 30, 2001 and the PSR scheduled for April 17, 2001. There are two follow-on update releases planned: the 6A.XX Release scheduled for mid July, 2001, and the 6A.P Release scheduled for mid September, 2001.

3.3.1 NCRs

ECS separated the 6A code baseline from the 5B baseline in August, 2000. Since this separation, the 6A code baseline has continued to receive fixes for NCRs observed in the 5A and 5B code baselines. Historically, the expected work-off rate of these NCRs is approximately 100 per month. With delivery of 6A to the DAACs in April of 2001, approximately 1,000 NCRs are expected to be fixed or closed to the 6A code baseline. In addition to the NCRs incipient to the 5A and 5B code, NCRs resulting from the development of 6A code will also be fixed during this time period. These NCRs are expected to number approximately 100, based on established software lines of code.

3.3.2 Release 6A COTS Changes

The COTS software products to be upgraded during the 6A release time-frame have been identified. The detail information regarding these COTS including the rationale for upgrade, dependencies with custom code and other COTS products, and impact to the operations at the DAACs due to the upgrade is provided in DID 335, "COTS Deployment Plan Volume 4." The DID was submitted to ESDIS on 01/19/2001.

Upgrades to the ECS hardware configurations are planned for the 6A timeframe. These include the replacement of the FDDI networks with gigabit ethernet networks at both GSFC and EDC to handle the increased throughputs of Terra reprocessing along with normal processing for Aqua. An upgrade of the SGI archiving machines from Challenge to Origin configurations will also take place at this time. In addition, to handle the increased load, the Science Data Server configurations (both the SDSVR and Sybase SQS hosts) at both EDC and GSFC will be upgraded so that the request load is shared between two separate host configurations. Additional staging disk will be added to the 6A configuration to handle the increased data ingest/distribution loads. An additional SGI Origin processor will be added to the Science Processing configuration at GSFC to handle the additional Aqua MODIS processing load.

The SGI Challenge machines from the archive Origin replacement mentioned above will be re-hosted at these sites. Table 3.3.2-1 provides some of the major hardware upgrades for GSFC and EDC.

Table 3.3.2-1. 6A Hardware Upgrades

Site	Subsystem	Mission	Disks	Server	Other
GSFC	APC	Terra	100 GB	SGI ORIGIN, 8CPU	
		Aqua	500 GB	SGI ORIGIN, 8CPU	
				SGI ORIGIN, 8CPU	
				SUN 3500, 4 CPU	
	DRP	Terra	500 GB	SGI ORIGIN, 8CPU	
			500 GB	SGI ORIGIN, 8CPU	
		Aqua	500 GB	SGI ORIGIN, 8CPU	
			500 GB	SGI ORIGIN, 8CPU	SILO
				SGI ORIGIN, 8CPU	
	SPR	Aqua		SGI ORIGIN, 32CPU	
	DIST	Aqua			PDS Hardware
EDC	APC	Terra	86GB	SGI ORIGIN, 8CPU	
		Aqua	144GB	SGI ORIGIN, 8CPU	
	DRP	Terra	500 GB	SGI ORIGIN, 8CPU	
			500 GB	SGI ORIGIN, 8CPU	
		Aqua	500 GB	SGI ORIGIN, 8CPU	SILO
	DIST	Aqua			PDS Hardware

3.4 Test Approach

The ECS Test Engineering organization reflects teams that are oriented to the major ECS system development functions of System Infrastructure, Planning & Data Production, Data Archiving & Distribution, and Interoperability, while retaining individual subsystem coverage within the teams. This system orientation aligns well for testing to specifications containing the acceptance criteria for major system functions (Tickets) that cross subsystem boundaries. The acceptance testing has a distinct system perspective for 6A. Additionally, the test organization is very well aligned with the ECS Software Development organization, permitting clear linkage between test engineers and their software counterparts, test engineering participation in software requirements, preliminary design, and detailed design reviews, and collaboration on appropriate test approaches to ensure full test coverage between the organizations.

The objective of the ECS formal Acceptance Testing activity is to verify that the Release 6A software is compliant with the Level 3 requirements through verifying satisfaction of Acceptance Criteria specified in the test Tickets. Additionally, regression testing is performed for each new release of the custom software. Test cases are utilized to verify custom software functionality in accordance with the acceptance criteria specified in the Tickets. Verification will be formal and witnessed by the customer representative.

Major Test Engineering milestones for 6A are the 6A IRR, TRR, CSR, PSR and SRA. The test program proceeds in sequential phases (see following) marked by key activities, reviews and documentation. The reviews (both internal and external) and documentation provide a forum for status and progress of the Acceptance Test program.

Phase 1: Development of Test Plan. This effort is built upon the following sources of information:

- This Science System Release Plan
- The Requirements Verification Traceability Matrix (RVTM) captured in the Verification Data Base (VDB)
- Requirements and Acceptance Criteria specified in the Tickets
- Participation in the Development organization's requirement reviews, preliminary design reviews, detailed design reviews, and integration activities.

As the predecessor step to the Test Planning process, the Systems Engineering organization's Architect Office (AO) generates the Tickets, populating the VDB with RCs, Level-3 requirements, Interface Design Specifications, Level-4 requirements, and Acceptance Criteria. The VDB also provides the traceability between Acceptance Criteria and Acceptance Test Cases.

The HW and SW target environments are analyzed to determine the expected fidelity of testing in the VATC and PVC. Additionally, the analysis identifies any test that, due to the nature of the acceptance criteria or lack of Test Facility resources, will need to be verified in one or more of the DAAC environments.

Test Engineering allocates the 6A Tickets generated from the VDB data to the appropriate test development teams. The test teams then generate the test case descriptions needed for the ECS Science Acceptance Test Plan (DID 409/VE1), published in draft form by IRR, and finalized within 30 days after IRR.

The Test Plan provides:

- A presentation of the 6A Acceptance Testing methodology.
- A list of Test Cases, including, the objective and a summary of each test, and identification of test inputs, test outputs, and test configuration.
- A mapping of Test Cases to the Acceptance Criteria specified in the tickets.
- The criteria for acceptance of each test case.

Phase 2: Refinement of Test Plan and Development of Test Procedures. In addition to review of the 6A Tickets, test engineers participate in requirements reviews, Preliminary Design Reviews (PDRs), and Detailed Design Reviews (DDRs). They also interact with software developers during integration test development, and participate in integration test reviews and conducts. Early involvement with and support to the Development team permits the test engineers to gain a more in-depth understanding of the functionality and associated 6A software implementation.

Acceptance test procedures are produced by first developing a high level outline of the test flow, followed by a functional description of test actions, and then completed by the detailed test actions. Test Engineers also determine test dependencies, interactions, and sequences. As each test procedure is produced, it undergoes internal review (including a peer review presentation)

and update before it is submitted to the Government for review as a component of the ECS Science Acceptance Test Procedures (DID 411). It is then processed for comment and approval.

This phase concludes with final Government approval of the test cases.

Phase 3: Execution of the Test Plan in Landover. Test Engineering accepts turnover of a software release from the Construction Office of the Development organization. Following 6A release turnover, the software is installed and checked out, then regression tested in a dedicated mode(s) in the test facility. Regression testing is conducted to ensure that existing software is not adversely affected by new custom software.

Upon successful installation and checkout, and when test data, tools, and resources are available, test engineers dry run the Government-approved acceptance tests. A Test Readiness Review is held internal to the program in order to present status and determine if the software, environment, configuration, data, tools, and documents are ready to proceed to formal testing. After dry run and affirming TRR, the test cases are formally conducted with witnesses present to verify satisfaction of specified Acceptance Criteria.

To the extent possible, external interfaces are exercised in the target test environment under conditions that simulate an operational environment. In cases where it is not possible to achieve the necessary level of fidelity in the test facility, formal sell-off of acceptance criteria will occur in one or more DAAC environment(s), as described in the Test Plan.

After acceptance testing and verification of the software, this phase concludes with a Consent-to-Ship Review (CSR). The CSR documents the results of the test program, including acceptance criteria verification status, liens associated with the release, and a lien work-off plan if needed. A successful CSR documents approval by the ECS Program and ESDIS to deploy the Release 6A software to the DAACs. The ECS Science Acceptance Test Report (DID 412/VE2), which formally documents the results of the acceptance testing, is published in draft form within two weeks following the CSR, and the final report is published within thirty days of the final SRA.

Phase 4: Execution of the Test Plan at the DAACs. Before deployment of the release, ECS ensures close-coordination with each DAAC to plan the on-site delivery. This includes on-call ECS/Landover support for release 6A installation and checkout as needed. The deployment of Release 6A is performed in accordance with the 6A Transition Plan.

Following a Pre-Ship Review (PSR), the software is shipped to the DAACs. The DAAC staff installs the release and performs site installation and checkout in a test mode (nominally, TS2). The subsequent site testing, lead by the DAAC personnel, focuses on regression testing and DAAC-specific Launch-Critical and Launch-Essential scenarios. Also of concern are configuration issues that must be identified and resolved prior to operations. In general, this is not an extension of acceptance testing although there may be cases where specific acceptance criteria and interfaces must be tested at the DAAC.

DAAC testing occurs over an extended period to allow DAAC staff to gain experience with a new release prior to transition to operations.

This phase concludes with a final (joint) Site Readiness Assessment (SRA) for each DAAC to review the completion of the installation and test program at all DAACs. At the SRA, the results of site testing are documented.

3.4.1 Test Procedure Development Process

Test Engineering assigns resources to each expected Ticket containing the requirement groupings and acceptance criteria. As Tickets are developed, the Systems Engineering Architect Office (AO) provides them to the Test Engineering organization for review and signoff. The initial development of test cases starts with the issue of the draft Ticket. Test Engineering generates the test case summaries as a component of the Test Plan. Prior to posting Tickets, an internal review of each Ticket is held by AO with stakeholders, including participation by Software Development and Test. After disposition of issues associated with a Ticket, it is posted for Government review and comment.

Test engineers participate with software developers in requirements reviews, Preliminary Design Reviews (PDRs), and Detailed Design Reviews (DDRs). They also interact with software developers during integration test development, as well as participate in integration test reviews and conducts. Early involvement with, and support to the Development team, permits test engineers to incorporate lessons learned from integration testing into test case development, as well as to gain an understanding of the capabilities and implementation represented in 6A software.

Test Engineering refines the test cases as the Tickets are updated and reviewed internally by peers and externally approved by ESDIS. Development of each draft test case continues until complete and ready for review. The responsible test engineer generates an internal review package. A peer review presentation is conducted for representatives from the Architect Office, Software Development, Operations, and Test. After the peer review, the test case is updated per review comments and re-posted to the web site, and ESDIS is notified that the test case is ready for Government review and approval. ESDIS reviews and approves the test procedures.

3.4.2 System Verification Process

At the completion of Release 6A software integration in the Engineering Development Facility (EDF), turnover of the software release from Software Development to the Test Engineering organization occurs. After turnover, installation, checkout and regression testing of the release software in the target Test Facility (VATC/PVC) is accomplished. After installation and checkout, regression testing is also performed. Dry run and refinement of acceptance test cases may begin any time after checkout.

Prior to formal test conduct, a Test Readiness Review (TRR) is conducted. The TRR is an internal review under the control of the ECS Test Engineering team. The TRR baselines the Government-approved revisions/comments to the test cases.

TRR is monitored to ensure that 1) all software integration has been successfully completed; 2) all necessary documentation or installation procedures needed are available; 3) a successful installation and checkout has occurred and the configuration and environment will support

acceptance testing; 4) and any other important information is communicated to or by the Test Engineering Organization prior to the start of formal testing.

Upon successful dry run of a test case and after TRR, the acceptance test is formally conducted before a government witness in accordance with Test Engineering project instructions and work instructions, including execution of a test, test conduct documentation, and gathering test artifacts. Schedules for all formal acceptance test conducts are coordinated with ESDIS in advance.

3.4.3 Regression Testing

The purpose of Regression Testing is to exercise the major functions of ECS to provide confidence that the addition of new custom or COTS software does not adversely affect the behavior of unmodified code.

Test cases have been selected and integrated into system threads contained within four DAAC operational scenarios -one for each of EDC, GSFC, LaRC, and NSIDC. Regression Tests utilize normal production scenarios that exercise ECS capabilities concurrently for a 4-hour period. Each DAAC scenario is tailored by facility and contains the following:

- Test Checklist providing a list of functional system threads.
- Representative sample of tests that exercise software functions
- Additional tests that focus on software functions likely to be affected by a new release/update
- Tests focusing on software components that have changed

Tests are selected from existing End-to-End and Acceptance test cases from previous releases of the ECS software. To select the test set for regression testing, major system functions are identified, and existing tests are allocated to a function. Analysis is performed and duplicate test coverage eliminated. System test threads are formulated using test procedures.

The system test threads are then incorporated into the Test Checklist, which is tailored for each test facility and DAAC. The Test Checklist is used to select threads that may be impacted by each new patch or release, ensuring complete coverage of the affected software.

A core set of regression test cases has been developed based on threads of current ECS functionality. These test cases include a scenario beginning with ingest and archive, production, search and order, and distribution. This scenario is designed to test the basic functionality of the system after a release or patch is installed. By running this test each time, expected results form a baseline for future regression testing of the system.

In addition to the Insertion-Production-Retrieval scenario, several other test cases might be developed based on related functions not tested in the core scenario. Any functionality not tested in the Insertion-Production-Retrieval scenario is categorized into threads. These threads are tested only if the new functionality may affect it.

Finally, new functions that are delivered with each new drop or patch is analyzed, and a determination is made as to which components could be affected by the new software. Existing regression test cases are updated to include the new functionality.

Regression testing is performed after each new software release. Regression testing is also performed at the DAACs after installation and checkout of 6A after CSR. These regression tests are tailored to include test cases that exercise specific capabilities of interest to the DAAC, in addition to the general capabilities of the 6A software.

3.4.4 Site Testing

ECS will coordinate with each DAAC to plan the on-site delivery of 6A software, including ECS/Landover support for installation and checkout and later transition in operations from 5B to 6A. Deployment of Release 6A will be performed in accordance with the 6A Transition Plan.

The ECS test team and DAAC staff install the release, then perform installation and checkout in a test mode under the direction of the ECS staff. Subsequent site testing lead by the DAAC personnel includes regression testing tailored for the particular DAAC, and DAAC-specific scenarios. These tests include a test scenario that exercises the system in an end-to-end manner to ensure that the system is stable, its performance supports 6A-specified needs, and it operates properly in its intended environment.

This testing is generally not an extension of acceptance testing, however, there may be cases where specific acceptance criteria and interfaces must be tested at the DAAC because the resources at the Landover test facility do not support the testing.

While the system is expected to satisfy 6A criteria at each DAAC, there might be differences between versions of COTS products in the Landover Facility test environments and each of the DAACs. This is due to each DAAC having its own timetable for upgrading COTS packages. DAAC-unique configurations and software packages may also result in unexpected system manifestations.

Test Team support of the 6A installation and checkout, and regression testing is a planned two-week activity for the existing DAACs.

3.4.5 End to End Testing

ECS plans to perform on-site End to End (ETE) testing for those sites where no testing has been performed earlier. Therefore, ECS has no plans for any DAAC Release 6A ETE testing. ETE testing is conducted as part of regression testing as explained in Section 3.4.3.

3.4.6 Performance Testing

Release 6A performance verification will consist of executing two 24 hour sustained operation tests using workloads that approximate the required loads for the Release 6A deployment timeframe. These tests will be self-contained and not use external interfaces. The success criteria will be the demonstrated ability of the system to execute each workload within a 24-hour period.

For Release 6A, GSFC and EDC DAAC workloads have been selected since they have the largest throughput rates. The workload specification is contained in Appendix A.

The workload specification has been derived from the SOW and F&PRS requirements for mission support, capacity phasing, and catch-up rates. The workloads use granule sizes, granule counts and PGE execution frequencies as defined in the ECS technical baseline. At its discretion, ECS will use synthetic data/PGEs, real data/PGEs, or a combination to implement the workload.

Performance Verification will be performed in the Landover Performance Verification Center (PVC). It is anticipated that the PVC will not provide sufficient capacity to fully test performance in all areas. The likely areas of reduced capacity are:

- fewer science processor CPU's and processing disks than the largest DAAC;
- fewer silos and archive tape drives than the largest DAAC; and
- fewer physical media distribution devices than the largest DAAC.

In this case, the workload specification will be adjusted to be consistent with the PVC hardware and network capacity. For example, PGE execution times may be shortened to permit execution of full processing chains on a smaller number of CPU's. This approach will permit verification of the system's ability to plan and schedule the required number of PGEs per day on a smaller science processor configuration than would be required if baseline PGE execution times were used. Any changes required to the workload specification will be identified in an update to this document.

In order to reduce hardware, test development and execution costs, performance verification of secondary and/or low rate functions will not be performed. These functions include: failure recovery, failover, user registration; user profile update; user profile replication; user login; DAR submit; DAR status; directory search; GDS gateway requests; expedited data processing and distribution; ancillary data ingest from minor sources; and operator functions not related to core ingest, archive, production, and distribution.

Performance verification will be performed over a six-week period as shown in the schedule contained in Appendix E. The first representative DAAC workload will be executed during the first week of testing. The second representative DAAC workload will be executed during the second week of testing. The third and fourth weeks will be spent working on performance related NCR fixes and tuning activities. The two tests will then be rerun during the fifth and sixth weeks. The tests will be performed in OPS mode. No activity will occur in TS1 or TS2 during the tests. Appendix A provides the details of performance workload specification.

The PVC facility will be used for performance testing of 6A and has provided an IRIX 6.2 and 6.5 environment during the transition of the ECS code to IRIX 6.5. These activities occur prior to the 6A code turnover and do not pose a conflict with 6A performance testing.

The PVC Facility Manager will arbitrate scheduling of PVC resources, with top priority established for release performance testing activities.

3.4.7 COTS Testing

COTS packages are delivered in various ways – some COTS software packages are delivered with the ECS custom software and have an associated Ticket (including acceptance criteria), and some are delivered as autonomous upgrades to existing COTS software packages that are not part of the custom software delivery process and are handled through COTS Pre-Ship Review (PSR) process.

For each COTS package having an associated Ticket and delivered along with the ECS custom software, Test Engineering, via established process for custom software, develops new test cases.

For each COTS software upgrade not part of custom software delivery, the Test Engineering organization executes one or more regression tests to exercise system functionality and the COTS software upgrade package. Additionally, other major ECS functions may be exercised during this regression testing. This provides confidence that the COTS package upgrade has not adversely affected the behavior of unmodified software and the COTS supports system needs.

If a regression test case does not yet exist, Development organization or Raytheon Technical Services Company (RTSC) engineers develop a test case and provide it to Test Engineering. Regression Testing is performed on all COTS upgrades delivered to the VATC.

RTSC engineers install in the VATC, configure and checkout all COTS package upgrades. Thereafter, the ECS Test Engineering organization executes one or more regression tests to exercise system functionality that interfaces with, depends upon, or otherwise utilizes the COTS package.

Satisfactory completion of the VATC testing activities results in the product being prepared for a Pre-Ship Review (PSR). The PSR verifies all testing and performance milestones have been met, installation instructions prepared, and checked out before the product is released for delivery to the customer. A CCR is generated to accomplish this release.

3.5 Transition

3.5.1 Transition Strategy

The ECS Transition IPT will coordinate with each DAAC to plan the on-site delivery of a release, including ECS support for installation, checkout, and transition. The transition IPT is comprised of representatives from System Engineering, Development, Test Engineering, and M&O organization.

The DAAC staff, with support from ECS Landover, will install the release, perform integration, and conduct checkout in a test mode. Transition activities will proceed from TS2 mode, then to TS1, and finally into the OPS mode. The DAAC staff will then conduct subsequent regression tests tailored for that DAAC under DAAC specific scenarios. These tests will include end-to-end test that ensures the stability of the system and associated performance of the system.

This testing will not be an extension of acceptance testing.

The version of COTS products at each of the DAACs will be verified before starting the transition to ensure consistency with the baseline. The DAAC staff will be responsible to make updates to the DAAC unique configurations to avoid any problems during the transition.

3.5.2 Custom Code Transition

The transition of 6A release will be performed in accordance with the transition plan, 223-TP-001-001, "Transition Plan 5B to 6A for the ECS Project." The transition plan will be delivered to the DAACs and ESDIS at 6A PSR. The draft version of the plan will be made available to the stakeholders in March 2001.

The logistics of the transition training at ECS Landover will be coordinated with the DAACs to ensure that quality and timing of the training meets DAACs requirements.

3.5.3 COTS Transition

All the COTS software products to be upgraded during the 6A release time-frame as identified in DID 335, "COTS Deployment Plan Volume 4" can be upgraded in place except for Sybase ASE upgrade from 11.5.1 to 11.9.3 on ACG machine. A separate transition plan consisting of the strategy to gradually integrate Sybase ASE into the system will be provided at the Sybase ASE PSR.

3.6 Configuration Management Approach for PCA & FCA

The audit process consists of formal audits coordinated by CM in conjunction with ESDIS. During these audits all differences between the approved baseline configuration and "as built" configuration are documented.

Configuration audits are conducted to assure the integrity of the physical configuration and referred to as Physical Configuration Audits (PCA) and the functional configuration, referred to as Functional Configuration Audits (FCA). Audits are a prerequisite to formal approval of the site configuration at CSR.

PCAs are a formal assessment of the "as built" configuration to assure that it conforms to the approved baseline as described in the technical documentation package. A project-wide team led by CM conducts the PCAs. The team includes representatives from ESDIS.

PCAs audit both COTS software products and custom code software. In addition, the COTS PCA includes Operating System software, OS patches and configuration parameters. These audits employ automated scripts to compare DAAC configurations against baseline documentation. Medium priority NCRs generated during the audits are forwarded to a technical representative for problem resolution to ensure the system configuration integrity. For low priority NCRs correction is recommended to assure continued level of support. All differences between the audited configuration and the final tested configuration are documented and recorded in the DID 506 which is published 30 days after the final SRA. COTS and OS patches PCAs are conducted prior to each site SRA to assure that the site is prepared to receive the new delivery of custom code. Custom code PCAs are conducted following code installation at the

site (post SRA) to ensure that the delivery has been installed according to the baseline configuration.

FCAs are formal audits of test results to assure that each ECS product meets its specified performance requirements to the extent determinable by testing. The Quality Assurance Office conducts these audits with CM assistance throughout the software life cycle.

3.7 Customer Reviews

Customer reviews for 6A consist of Incremental Release Review (IRR), Consent to Shipment Review (CSR), and Site Readiness Assessment (SRA). Appendix C provides a preliminary agenda for each of these reviews.

The IRR addresses the requirements and their associated priority. It includes the design aspects of incorporating the requirements into the system, the detailed requirements and requirement verification traceability, and a draft Acceptance Test Plan. Early definition of the Acceptance Test Plan, which reflects code and unit test, integration and test efforts, and formal verification test activities ensure continuity and coherence throughout the 6A development cycle. Development will support IRR by presenting requirements and design material (ops scenarios and use cases, external interfaces, software to hardware mapping; and user interfaces) for the major functionality in the Release 6A.

In general, the IRR is planned to precede the code and unit test activities associated with the release and provides the essential components of a combined System Requirements Review and Design Review. A successful IRR constitutes government approval to proceed. CDRL items for the IRR are produced as required in Section 3.7. The IRR is scheduled prior to the completion of design activities, to enable early detection of design oversights and allow changes or updates to occur before coding begins. Once the requirements baseline is established, Systems Engineering provides preliminary design, detailed design, and implementation support to ensure that the system design and/or performance requirements are not compromised by design or implementation decisions. An additional task involves the generation of the operational transition plan to support migration of existent DAACs from 5B to 6A.

Following a successful TRR, an ECS internal event, the software release is installed in a dedicated mode(s) in the VATC for formal testing. Formal tests are run to verify a predefined set of system capabilities reflected in the L3 and L4 requirements. A prerequisite for formal execution of tests is ESDIS approved test procedures. This phase concludes with a CSR. The CSR documents the results of the VATC test program including requirement verification status, liens associated with the release, a lien work-off plan, and the most recent PCA results at each DAAC.

The SRA will be conducted to review the completion of the release installation and checkout at each DAAC. At the SRA, the results of acceptance testing, custom software PCA, and existing liens against system functionality with work-off plans including determination of system readiness to transition are documented and reviewed.

3.8 6A CDRL List

The documents associated with the delivery of Release 6A are provided in the Appendix D. This Appendix provides the list of 6A documents as well as the schedule of delivery.

3.9 Schedule of Key Activities

The project schedule is maintained on line with the Primavera system and is compiled and delivered to the customer on a weekly basis as the weekly 447 report. Additionally, on-line access is provided to compiled project schedule in the Primavera system. Appendix E provides a high level schedule for 6A activities.

3.10 Progress Metrics

Metrics are used as a management tool to assess progress, adjust resources, and aid in the delivery of ECS/SDPS. Planned versus actual metrics aid in determining progress towards the planned goals. All subsystems and disciplines use these types of metric. Other types of metrics include the rate of discovery of problems or issues, the rate of changes in code, and the rate of new code being developed. These rate metrics provide trends that predict system stability and help identify additional potential resource needs. The Program Manager will maintain a sustained emphasis on continually improving the data collection, analysis and presentation of the relevant metrics of the project.

Selected metrics presentation charts and their updates are presented at the Daily Status Reviews (DSR), and posted for use and reference by interested individuals, and formally provided in the weekly update to the monthly program report.

Current metrics delivered each week include:

- Code & Unit Test Plan vs. Actual
- Integration Plan vs. Actual
- Severity 1, 2, & 3 NCRs Prior to 'T' State
- NCR Work-off Actuals vs. Projections
- DAAC Support Desk Trouble Tickets Open vs. Closed
- SLOC by Sub-System
- SV/AT Tests Planned vs. Actual
- Verification Progress Status, Schedules, and Variances

3.11 Government Furnished Information

The following table (3.11-1) provides the list of known GFE/GFI as of the publication of this document. The detailed list is reviewed on weekly basis at the DSRs.

Table 3.11-1. Release 6A GFE/GFI List

GFE/GFI Description	Need Date
DAS (DAO) ICD	11/24/99
SIPS MODAPS PM-1	03/10/00

3.12 Risk Mitigation Plans

3.12.1 Risk Management Approach

Achieving balanced technical/cost/schedule performance, the ECS project emphasizes risk identification and management. This section describes the program's approaches to this critical process.

PM-1-002, the Risk Management Methodology (a Project Instruction) provides the details of ECS's risk management process. This process is composed of four stages. This section provides a brief and high level description of the four stages.

Stage 1, Risk Identification - Risk items will be identified over the course of the Program from routine ECS activities and recorded on the Program risks list.

Any ECS personnel can identify risks with potential technical, cost, or schedule impacts and report to the management. The Management will then designate a "Responsible Individual" to lead all activities related to that particular risk. Identified risks will be moved to the Risk Assessment stage of the Risk Management Process.

Stage 2, Risk Assessment - Detailed analyses of the identified risks and associated drivers are performed by the Responsible Individuals.

The analyses are conducted to discover the causes, effects, and magnitude of perceived risks. They consist of determining the probability of potential risk occurrence (probability of occurrence, Pf) with respect to design maturity, system complexity, and dependency variables and evaluating all technical, cost, and schedule consequences (consequence of failure, Cf) caused by the potential risk.

Stage 3, Risk Mitigation - In this stage, Program Management evaluates various mitigation alternatives presented by the Responsible Individual for cost, impact, effectiveness, and feasibility and approves a mitigation plan for implementation.

The mitigation plan identifies details of mitigation activities with schedules and the supporting organizations. It also provides detailed actions with schedules for completion.

For highly significant risks, contingency plans may also be developed and documented during this stage; contingency plans address the situation where the selected mitigation might fail, and provide for documented alternate courses of actions.

Stage 4, Risk Monitoring - After approval of a mitigation plan for implementation, the risk management team will periodically review the status of the related risk action items and assess

their progress via risk meetings. If there is any indication of an increase in the severity of the risk, the risk is referred back to the mitigation stage for further option analysis. In addition, risk metrics (impacts and probabilities) are reviewed and updated periodically.

3.12.2 Known Risks and Mitigation Strategies

Threats with potential technical, cost and schedule impacts will be routinely identified and evaluated during the normal course of program execution. Based on experience with the program to date, the following risks, which are interrelated and overlap, have been identified:

1. Resource compliance risk concerning ability to maintain required staffing skill mix, through both staff retention and hiring, for delivering release capabilities.

   ECS continues its aggressive hiring practices. Management is regularly assessing priorities and allocation of key resources to the critical activities as well as careful coordination among internal organizations to minimize schedule impacts.

2. Performance satisfaction risk that the ECS system will not meet all performance and RMA requirements.

   The mitigation strategy pertaining to meeting performance requirements is measurement of ECS performance in the PVC and at the DAACs and, if necessary, procurement of hardware or provision of additional SLOC for performance improvements. Other mitigation strategies include tuning and re-allocation of hardware.

   There is an additional risk that the ECS architecture may not satisfy the RMA and Failover requirements and additional material may be needed. There is an ongoing joint evaluation with ESDIS of H/W and S/W RMA requirements. ECS continues to assess RMA for its systems at the DAACs and plans to implement formal data collection prior to Release 6B. If necessary, the H/W and S/W configurations will be augmented or modified.

3. Concern for technology obsolescence and ensuring a sustainable ECS at end of contract (EOC).

   Using available resources it is necessary to establish an approach to have sustainable COTS SW products on ECS system at EOC. It is envisaged that in a sustainable system every COTS SW product is under active maintenance past end of contract for duration required to upgrade that particular COTS. There is a risk due to resource and schedule constraints that not all required COTS SW products will be upgraded by EOC. An evaluation of the COTS baseline has been conducted. Significant improvement has been made in the COTS SW upgrade process resulting in cost savings. Mitigation activities include conducting technical tradeoffs of baselined COTS products, determining and eliminating redundant and obsolete COTS SW products, implementing Raytheon Six Sigma project recommendations and planning the COTS SW upgrade installation and testing in sync with custom code installation and testing.

   There are risks associated with the Operating System (OS) upgrade from Solaris 5 to 8. These risks include custom code integration and inter-operability with the upgraded OS and

COTS, the transition process, downtime, and recovery contingency at the DAACs. To support the OS upgrade Rogue Wave, Sun Compiler, and approximately 46 COTS are required to be upgraded and there is a schedule risk in meeting delivery dates due competing and conflicting priorities. Mitigation strategies include regression and stress testing and upgrade and transition process improvements.

4. Risk of not meeting program cost objectives due to operating costs in the PVC for 6B, EOC performance verification, and other new activities, exceeding PVC budget. Mitigation includes quality improvements and planning to ensure sufficient budget coverage to avoid overrun to budget and cost variance at completion. Plans are underway to ensure sufficient resources for PVC operations to provide a better tested and tuned deployed ECS system.

5. Contract Sell Off risk involving EOC requirements reconciliation, EOC functionality verification and final NCR status.

   For EOC requirements reconciliation, the EOC CDRL list includes the delivery of DID 304 System Requirements Document. Informal agreement has been reached with ESDIS to allow the Verification Database (VDB) to satisfy the intent of DID 304 with the stipulation that the quality of requirements traceability achieved for releases 5B and beyond is insured for releases delivered prior to 5B. While a L3 requirement reconciliation activity was included in Mod86, effort to retroactively correct the requirements traceability of pre-5B releases was not included. However, without performing requirements reconciliation, the program will be in jeopardy of adequately substantiating sell-off of Level 3 requirements. Requirements traceability needs to be corrected for pre-5B releases, including the development and enhancement of tickets. ESDIS has indicated that the provision of tickets for pre-5B releases with the quality of those defined for release 5B and beyond would satisfy the intent of DID304. This activity must be completed prior to RRR.

   For EOC functionality verification, an analysis has been performed to identify unverified, and/or disputed acceptance criteria in the VDB and specific recommendations have been made for closing each of some 180 criteria. It is necessary to reach agreement with ESDIS to satisfy verification of those acceptance criteria currently identified as unverified in the VDB. The VDB must be updated to reflect the results of project/customer agreement and/or verification of outstanding acceptance criteria.

   In addition it is necessary to agree with ESDIS on final (non release) requirements for ECS and acceptable final NCR status.

6. Risk of Science Software requiring computer resources over and beyond the ECS contract baseline impacting the effectiveness of the operational systems at the DAACs.

   ECS will continue to support early SSI&T of science software to determine as early in the process as possible the potential impact of science software on provided computing resources. This includes monitoring requiring CPU, memory and disk and archiving resources. This will allow time for the instrument teams to better tune/optimize their algorithms in selected cases. For instruments teams where processing is being provided externally, ECS will support early interface testing to determine potential impacts on system ingest and archiving throughput.

7. Concern about DAAC-unique configurations and software packages resulting in unexpected system manifestations.

   While the system is expected to satisfy 6A criteria at each DAAC, there is concern regarding differences between versions of COTS products in the Landover Facility test environments and each of the DAACs. This issue is due to each DAAC having its own timetable for upgrading COTS packages.

   This is not a risk that the ECS program alone can mitigate. ECS will work closely with DAACs to schedule COTS product upgrades within the schedule required to maintain the baseline that supports 6A. Activities such as site unique testing, checkout testing, and transition should minimize the impact of this risk. Since the level of risk will depend on the specifics of the site differences, a full assessment can only be made once the specifics are known.

8. Timely and complete delivery of requirements from each of the instruments teams for production rules, ESDTs and test data.

   ECS will continue to work with ESDIS to obtain the requirements from each of the instruments teams for production rules, ESDTs and test data. This is not a risk that the ECS program alone can mitigate. ECS has notified ESDIS of the need dates for external information required to meet our schedule commitments and will continue to report progress on a weekly basis.

Appendix A. 6A Workload Specification

A.1 Introduction

This appendix contains the workload specification that defines the acceptance criteria for the performance verification test procedures. For Release 6A, GSFC and EDC DAAC workloads have been selected, as they contain the largest throughput rates. For each DAAC, an initial system state is defined as well as ingest criteria, production criteria, planning criteria, distribution criteria, data access criteria, and system backup criteria.

Performance verification will take place in the Landover Performance Verification Center (PVC).

A.2 GSFC Workload Specification

A.2.1 Initial System State

At the beginning of the 24-hour test, the system state shall be as follows:

a) User registrations required for the test have been performed.

b) ESDTs required for the test have been installed.

c) Volume group assignments have been made to mirror the volume group assignments at the DAAC.

d) The Science Data Server inventory database has been populated with 2,500,000 granules. A small subset of these granules will have browse associated with them. These granules will be used to support the Data Access plan specified in A.2.6. The associated archive will be populated with 10 TBytes of data.

e) The Subscription Server database has been populated with the subscriptions that are required to support the Distribution plan specified in A.2.5.

f) The Science Data Server inventory database and archive have been populated with 8 hours of MODIS PGE01, PGE02, and PGE03 output granules. These granules will be used to support the first 8 hours of the Distribution plan specified in A.2.5.

g) The Ftp Pull distribution area has been populated with at least 1,000 files linked to at least 250 directories.

h) One or more production plans have been created to cover the 8-12 hour pretest period (see item i below) and 24 hours of production (including Terra reprocessing) to be performed during the 24 hour test period (~120% of daily production requirement).

i) MODIS Level 1 production has been initiated and has reached steady state. That is, at least 80% of the science processor CPU's allocated to ops mode are in use. To achieve this, it is estimated that processing will need to begin 8 to 12 hours prior to the start of the test due to the fact that the DPREP PGE requires three Level 0 granules before it can run and the L1A PGE takes 4 hours to execute.

A.2.2 Ingest Criteria

The Ingest plan for the 24-hour test is as follows:

a) Two MODIS Level 0 granules shall be ingested every 96 minutes from a simulated EDOS, starting at hour 0. 30 granules shall be ingested during the 24-hour period (120% of the daily average. Accounts for both Terra and Aqua MODIS L0 ingest). Total data volume is 195 GB.

b) For Terra, one Terra ancillary granule shall be ingested every 96 minutes from a simulated EDOS, starting at hour 0. 15 Terra ancillary granules shall be ingested during the 24 hour period. For Aqua, three GBAD granules shall be ingested every 96 minutes from a simulated EMOS, starting at hour 0. 45 GBAD granules and one definitive orbit granule shall be ingested during the 24-hour period. Total data volume is < 1 GB.

c) One AM1ATTF granule shall be ingested every 96 minutes from a simulated FDS, starting at hour 0. 15 granules shall be ingested during the 24-hour period (120% of the daily average). One Aqua predicted orbit granule shall be ingested during the 24 hour period. Total data volume is < 1 GB.

d) Two MODIS Level 0 expedited granules shall be ingested every 30 minutes from a simulated EDOS, starting at hour 3 and ending at hour 21. 78 granules shall be ingested during the 19.5 hour period (120% of the daily average. Accounts for both Terra and Aqua MODIS Level 0 expedited data). Total data volume is < 3.9 GB.

e) One ASTER Level 0 expedited granule shall be ingested every 30 minutes from a simulated EDOS, starting at hour 3 and ending at hour 21. 39 granules shall be ingested during the 19.5 hour period (120% of the daily average). Total data volume is < 2.4 GB.

f) One ancillary granule shall be ingested every 144 minutes from a simulated larry server, starting at hour 0. 10 granules shall be ingested. Total data volume is < 1 GB.

g) 1 DAO granules shall be ingested every 60 minutes from a simulated DAS, starting at hour 0. 24 granules shall be ingested. Total data volume is 2 GB.

h) 157 MODIS higher level product granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 3768 granules shall be ingested during the 24-hour period. Total data volume is 146 GB.

i) 43 MODIS higher level browse granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 1032 granules shall be ingested during the 24 hour period. Total data volume is ~ 1 GB.

j) 20 MODIS higher level QA granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 480 granules shall be ingested during the 24-hour period. Total data volume is < 1 GB.

k) 157 MODIS higher level production history granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 3768 granules shall be ingested during the 24-hour period. Total data volume is < 1 GB.

l) 17 AIRS/AMSU/HSB Level 0 granules shall be ingested from a simulated EDOS every 96 minutes starting at hour 0 (120% of the daily average). 245 granules shall be ingested during the 24-hour period. Total data volume is 15.6 GB.

m) One expedited Level 0 granule for each AIRS, AMSU, and HSB shall be ingested every 30 minutes from a simulated EDOS starting at hour 3 through hour 21. 117 granules shall be ingested during the 19.5 hour period. Total data volume is 1.5 GB.

A.2.3 Production Criteria

The Production plan for the 24-hour test is as follows:

a) Perform 24 hours of DPREP processing. This requires 24 DPREP PGE executions that produce 72 output granules for Terra and 13 DPREP PGE executions that produce 26 output granules for Aqua. Total data volume is < 1 GB.

b) Perform 24 hours of MODIS L1A processing for Terra and Aqua and MODIS L1A reprocessing for Terra. This requires 288 PGE01 executions that produce 864 MOD01 granules and 864 MOD03 granules. Total data volume is 345 GB.

c) Perform 24 hours of MODIS L1B processing for Terra and Aqua and MODIS L1B reprocessing for Terra. This requires 864 PGE02 executions that produce 864 MOD02OBC granules, 864 MOD021KM granules, 864 MOD02HKM granules, 864 MOD02QKM granules, and 864 MOD021QA granules. Total data volume is 581 GB

d) Perform 24 hours of MODIS Cloud Mask processing for Terra and Aqua and MODIS Cloud Mask reprocessing for Terra. This requires 864 PGE03 executions that produce 864 MOD35_L2 granules, 864 MOD07_L2 granules, 864 MODVOLC, and 864 MODCSR_G granules. Total data volume is 65 GB.

e) Perform 24 hours of AIRS/AMSU/HSB higher level processing. This requires 332 PGE executions that produce 4,671 granules. Total data volume is 66 GB

A.2.4 Planning Criteria

The Planning criteria for the 24 hour test is as follows:

a) Starting at hour 8, enter and plan the production requests required for the next 24 hours of Terra and Aqua MODIS Level 1 production, Terra MODIS Reprocessing, and AIRS Level 1 and higher level production.

A.2.5 Distribution Criteria

The Distribution plan for the 24-hour test is specified in Table A-1.

A.2.6 Data Access/Deletion Criteria

The Data Access plan for the 24-hour test is as follows:

a) Submit 45 search requests per hour from EDG against the 2,500,000 granule inventory. The search requests should be spread across simulated EDG users.

b) Submit 19 search and integrated browse requests per hour from the EDG against the 2,500,000 granule inventory. The browse requests should be spread across 1 simulated EDG users.

c) A total of 8620 granules shall be deleted from the archive. This includes 5476 science, 516 browse, 2388 PH and 240 QA granules.

A.2.7 System Backup Criteria

The System Backup plan for the 24 hour test is as follows:

a) An incremental Sybase backup will be performed on all databases starting at hour 16.

b) An incremental file system backup will be performed on all servers starting at the completion of the Sybase backup.

Table A-1. GSFC Distribution Plan

Recipient	# Orders	Source	Product(s)	Media Type	Submit Time	# Granules Per Order	Size Per Order (MB)	Total Size (GB)
MODAPS	432	Subscription	MOD02OBC	FtpPush	Ongoing	1	57	24.62
MODAPS	432	Subscription	MOD021KM	FtpPush	Ongoing	1	262	113.18
MODAPS	432	Subscription	MOD02HKM	FtpPush	Ongoing	1	168	72.58
MODAPS	432	Subscription	MOD02QKM	FtpPush	Ongoing	1	168	72.58
MODAPS	432	Subscription	MOD35_L2	FtpPush	Ongoing	1	48	20.74
MODAPS	432	Subscription	MOD07_L2	FtpPush	Ongoing	1	28	12.10
MODAPS	432	Subscription	MOD03	FtpPush	Ongoing	1	62	26.78
MODAPS	288	Subscription	MYD02OBC	FtpPush	Ongoing	1	57	16.42
MODAPS	288	Subscription	MYD021KM	FtpPush	Ongoing	1	262	75.46
MODAPS	288	Subscription	MYD02HKM	FtpPush	Ongoing	1	168	48.38
MODAPS	288	Subscription	MYD02QKM	FtpPush	Ongoing	1	168	48.38
MODAPS	288	Subscription	MYD35_L2	FtpPush	Ongoing	1	48	13.82
MODAPS	288	Subscription	MYD07_L2	FtpPush	Ongoing	1	28	8.06
MODAPS	288	Subscription	MYD03	FtpPush	Ongoing	1	62	17.86
Total SIPS	5,040							570.96
EDC	39	Subscription	AST_EXP	FtpPush	Ongoing	1	62	2.42
Total EDC	39							2.42
GDS	39	Subscription	AST_EXP	FtpPush	Ongoing	1	62	2.42
Total GDS	39							2.42
$PDS	2679	SCLI	Various	FtpPush	Ongoing	1	194.5	521
Total Media	2679							521
SIPS1	98	Mach/Mach	MOD2HKM, MOD2QKM	FtpPush	Ongoing	1	172	16.85
Xrun2	720	Subscription	MOD01	FtpPush	Ongoing	1	354	254.88
Xrun1	88	EDG	MOD2QKM	FtpPull	5per hour starting at hour 2	12	2064	181.63
Xrun1	24	EDG	Various AIRS	FtpPull	1 per hour starting at hour 0	12	2,914	69.94
Total Elect	832							506.45
Total User	3609							1044.3
Total Distribution	8727							1620.1

A.3 EDC Workload Specification

A.3.1 Initial System State

At the beginning of the 24-hour test, the system state shall be as follows:

a) User registrations required for the test have been performed.

b) ESDTs required for the test have been installed.

c) Volume group assignments have been made to mirror the volume group assignments at the DAAC.

d) The Science Data Server inventory database has been populated with 2,500,000 granules and a snapshot of the EDC Landsat 7 inventory taken around 11/1/99 (estimated at 30,000 granules). A small subset of the 2,500,000 granules will have browse associated with them. These granules will be used to support the Data Access plan specified in A.3.6. The associated archive will be populated with 10 TBytes of data.

e) The Subscription Server database has been populated with the subscriptions that are required to support the Distribution plan specified in A.3.5.

f) The Science Data Server inventory database and archive have been populated with 200 ASTER PGE02, PGE03, PGE04, PGE05 and PGE06 output granules. These granules will be used to support the first 8 hours of the Distribution plan specified in A.3.5.

g) The Science Data Server inventory database and archive have been populated with 100 L70RWRS scenes. These scenes will be used to support the first 8 hours of the Distribution plan specified in A.3.5.

h) The Ftp Pull distribution area has been populated with at least 1,000 files linked to at least 250 directories.

A.3.2 Ingest Criteria

The Ingest plan for the 24-hour test is as follows:

a) 372 ASTER L1B granules shall be ingested from D3 tape, starting at hour 0. Total data volume is 47 GB.

b) 937 ASTER L1A granules shall be ingested from D3 tape, starting when the D3 tape drive is available following the L1B ingest. Total data volume is 116 GB.

c) One ancillary granule shall be ingested every 120 minutes from a simulated larry server, starting at hour 0. 11 granules shall be ingested during the 24-hour period. Total data volume is < 1 GB.

d) 3 ASTER L0 expedited granules shall be ingested every 60 minutes from a simulated GDAAC, starting at hour 3. 39 granules shall be ingested during the 24-hour period. Total data volume is < 3 GB.

e) Approximately 84 L70R granules (F1 and F2) shall be ingested using a simulated L7 contact plan. The total number of scenes contained in these granules shall be 336.

f) Metadata for 345 IGS scenes shall be ingested from a simulated SMC, via FTP pull, starting at hour 18. Total data volume is < 1 GB.

g) 323 MODIS higher level granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 7745 granules shall be ingested during the 24-hour period. Total data volume is 385.6 GB.

h) 80 MODIS higher level browse granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 1920 granules shall be ingested during the 24 hour period. Total data volume is ~ 2 GB.

i) 40 MODIS higher level QA granules shall be ingested every 60 minutes from a simulated MODAPS interface server, starting at hour 0. 960 granules shall be ingested during the 24-hour period. Total data volume is < 5 GB.

A.3.3 Production Criteria

The Production plan for the 24-hour test is as follows:

a) Routinely produce ASTER DST products from the ASTER L1B granules ingested from D3 tape. This requires 372 executions of the various DST PGEs that produce 1,116 output granules. Total data volume is 40 GB.

b) Process 75 on-demand requests for ASTER AST_07 products. This requires the execution of 75 ASTER ACVS PGEs. Total data volume is 20 GB.

c) Process 75 on-demand requests for ASTER AST_09 products. This requires the execution of 75 ASTER ACVS PGEs. Total data volume is 20 GB.

d) Process 75 on-demand requests for ASTER AST_09T products. This requires the execution of 75 ASTER ACT PGEs. Total data volume is 1 GB.

e) Process 75 on-demand requests for ASTER AST_05 products. This requires the execution of 75 ASTER ETS PGEs. Total data volume is <1 GB.

f) Process 75 on-demand requests for ASTER AST_08 products. This requires the execution of 75 ASTER ETS PGEs. Total data volume is <1GB.

g) Process 75 on-demand requests for ASTER AST_04 products. This requires the execution of 75 ASTER BTS PGEs. Total data volume is < 1 GB.

A.3.4 Planning Criteria

The planning criteria for the 24-hour test is as follows:

a) Within the 24-hour test period, perform the planning required to produce the number of ASTER DST products specified in A.3.3.

b) Within the 24-hour test period, perform the planning required to produce the number of ASTER on-demand products specified in A.3.3.

A.3.5 Distribution Criteria

The Distribution plan for the 24-hour test is specified in Table A-2.

Table A-2. EDC Distribution Plan

Recipient	# Orders	Source	Product(s)	Media Type	Submit Time	# Granules Per Order	Size Per Order (MB)	Total Size (GB)
$PDS	2,430	SCLI	Various	FtpPush	Ongoing	1	100	243.00
Total Media	2,430							243.00
Xrun2	372	Subscription	ASTL1B	FtpPush	Ongoing	1	126	46.87
Xrun2	1,360	Subscription	Various MODIS	FtpPush	Ongoing	1	100	136.00
Xrun1	75	ODFRM	AST9, AST7,	FtpPull	5 per hour starting at hour 8	2	536	40.2
Xrun1	75	ODFRM	AST09T	FtpPull	5 per hour starting at hour 8	1	13	0.97
Xrun1	75	ODFRM	AST05, AST08	FtpPull	5 per hour starting at hour 8	2	12	0.9
Xrun1	75	ODFRM	AST04	FtpPull	5 per hour starting at hour 8	1	7	0.52
Xrun1	5	EDG	ASTL1B	FtpPull	4 per hour starting at hour 2	7	882	4.41
Xrun1	90	EDG	L70RWRS	FtpPull	6 per hour starting at hour 2	1	500	45.00
Total Network	2127							274.87
Total Distribution	4557							517.87

A.3.6 Data Access/Deletion Criteria

The Data Access plan for the 24-hour test is as follows:

a) Submit 45 search requests per hour from EDG against the 2,500,000 granule inventory. The search requests should be spread across one simulated EDG user.

b) Submit 19 search and integrated browse requests per hour from the EDG against the 2,500,000 granule inventory. The browse requests should be spread across 1 simulated EDG users.

c) A total of 8899 granules shall be deleted. This includes 5517 science, 960 browse, 1943 PH and 480 QA granules.

A.3.7 System Backup Criteria

The System Backup plan for the 24-hour test is as follows:

a) An incremental Sybase backup will be performed on all databases starting at hour 16.

b) An incremental file system backup will be performed on all servers starting at the completion of the Sybase backup.

A.4 Post-Test Reporting Requirements

The following information shall be provided one day after each formal test:

a) Actual work accomplished vs. planned work.

b) List of hardware and software failures that occurred during the test.

c) NCRs for all new defects found during the test.

The following information shall be provided six weeks after completion of both formal tests:

a) Resource usage analysis (e.g., CPU, memory, disk I/O) for each hardware platform.

b) Response time analysis for search and browse requests.

c) Memory growth analysis for key servers.

A.5 Workload De-rating Analysis

Tables A-3 and A-4 show the relative capacity of the PVC configuration compared to GDAAC and EDAAC. Each row in each table shows the percentage of capacity provided in the PVC versus the DAAC for a server (or set of servers) that implements one or more performance-critical threads. The comparisons were made against key server resources as follows:

- If there was more than one instance of a server type (e.g., science processor) in the configuration then the resource was totaled across all of the server instances.
- CPU - The total Mhz provided in each configuration was determined by multiplying the number of CPU's in all servers times their Mhz rating. The total Mhz in the PVC configuration was then divided by the total Mhz in the DAAC configuration.
- IOPS - The total Input Output Operations Per Second provided in each configuration was determined by multiplying the number of storage controllers in all servers times their performance factor. A performance factor of 1 was used for SCSI storage controllers and a

performance factor of 5 was used for FC storage controllers at the DAACs. A performance factor of 3.5 was used for FC storage controllers in the PVC since the PC contains older, slower FC storage controller cards. The total IOPS in the PVC configuration was then divided by the total IOPS in the DAAC configuration.

- I/O Throughput – The sustained I/O throughput provided in each configuration was determined based on the number and type of storage controllers. To obtain sustained throughput, a peak throughput de-rating factor of 0.5 was used for configurations containing SCSI storage controllers and a de-rating factor of 0.6 was used for configurations containing FC storage controllers. The total sustained throughput in the PVC was then divided by the total sustained throughput in the DAAC configuration.

- Disk Cache - The total RAID size provided in each configuration was determined by multiplying the number of disks attached to all servers times their size. The total RAID size in the PVC was then divided by the total RAID size in the DAAC configuration.

- Memory - The total memory provided in each configuration was determined by adding the memory in all servers. The total memory in the PVC configuration was then divided by the total memory in the DAAC configuration.

- Tape Drive - The total number of archive tape drives in each configuration was determined by adding together the drives in each silo. The total tape drives in the PVC configuration was then divided by the total tape drives in the DAAC configuration. Note that this comparison is somewhat misleading because the PVC contains three types of drives (D3, 9840, 9940) in each silo while the DAACs use only D3 drives. While the PVC contains more drives, only a subset of these drives can be used to mount any given tape based on its media type.

Table A-3. Percentage of Capacity Provided by the PVC vs. GDAAC

Function	CPU	IOPS	I/O Thruput	Disk Size	Memory	Tape Drive
icg - Ingest	50%	100%	50%	64%	50%	N/A
spg - Science Processors	42%	24%	40%	44%	57%	N/A
pls - Planning DBMS	100%	N/A	N/A	N/A	300%	N/A
sps - PDPS Queuing Server	50%	N/A	N/A	N/A	100%	N/A
acs - SDSRV	100%	N/A	N/A	N/A	100%	N/A
acg - SDSRV DBMS, Pull Area, Browse	100%	53%	75%	53%	25%	N/A
drg - Archive Servers	90%	46%	60%	72%	50%	N/A
silo - STK Silos	N/A	N/A	N/A	N/A	N/A	131%

Table A-4. Percentage of Capacity Provided by the PVC vs. EDAAC

Function	CPU	IOPS	I/O Thruput	Disk Size	Memory	Tape Drive
icg - Ingest	50%	100%	50%	81%	50%	N/A
spg - Science Processors	168%	69%	145%	200%	267%	N/A
pls - Planning DBMS	100%	N/A	N/A	N/A	300%	N/A
sps - PDPS Queuing Server	100%	N/A	N/A	N/A	150%	N/A
acs - SDSRV	67%	N/A	N/A	N/A	50%	N/A
acg - SDSRV DBMS, Pull Area, Browse	100%	53%	75%	50%	25%	N/A
drg - Archive Servers	88%	50%	40%	61%	50%	N/A
silo - STK Silos	N/A	N/A	N/A	N/A	N/A	121%

A.5.1 GDAAC Scenario Analysis

The key limiting resources in the GDAAC scenario are the CPU capacity of the science processors (42% of GDAAC), CPU capacity of the PDPS queuing server (50% of GDAAC), I/O throughput of the archive servers (60% of GDAAC), disk cache available on the archive servers (72% of GDAAC), and disk cache available on the science processors (44% of GDAAC). The GDAAC scenario compensates for the reduced science processor CPU capacity by configuring the synthetic PGEs to use only a small amount of CPU resources. Since the PGEs do read and write full-sized input and output files, it is estimated that only 70% of the production workload will be achieved during the 24 hour test period due to archive server disk cache and I/O throughput limitations, as well as PDPS job scheduling efficiency and the reduced size of the science processing disk cache. Additionally, an unrealistic load would be imposed by generating the AIRS daily products which require 240 inputs. Because of the reduced size of the science processing disk cache, it is likely that most of these inputs would need to be re-staged from the archive causing significant delay. For this reason, the 8 daily product processing PGE's will not be executed during the scenario. Reduced production will cause a corresponding decrease in the subscription-based distribution workload since only 70% of the planned subscriptions will be triggered. Because of this, the overall achievable percentage of distribution workload is estimated to be 79%. 100% of ingest workload is expected to be achieved.

A.5.2 EDAAC Scenario Analysis

The key limiting resources in the EDAAC scenario are the CPU and memory capacity of the ingest platform (50% of EDAAC) and the number of archive tape drives available to support Landsat 7 distribution (29% of EDAAC). It is estimated that only 75% of the ingest workload will be achieved during the 24 hour test period due to the load on the ingest platform. This will cause a corresponding decrease in the subscription-based distribution workload related to MODAPS ingest. Due to the way in which volume groups are allocated to media types, only two D3 tape drives are available to support the staging of Landsat 7 subintervals required for Landsat 7 distribution. This is expected to limit the achievable percentage of Landsat 7 distribution to 70%. Overall, the achievable percentage of distribution workload (by volume) is estimated to be 90%. 100% of production workload is expected to be achieved.

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Appendix B. L3 and IRD Requirements€

Table B-1 contains the Release 6A L3 requirements from Revision B of the December 1998 F&PRS including changes assumed by ECS for the Option A+ ECS Restructure Proposal. Interpretations of some L3 requirements are included to facilitate agreement on their meaning. Several performance/capacity requirements are included which can not be completely satisfied until the end of the contract. They will be evaluated for their applicability to Release 6A.

Table B-1. L3 Requirements

L3 ID	Rel	L3 Text	Interpretation Text
DADS0430	6A Partial	The ECS shall provide its operations personnel the capability to manually alter the routing of data sets to physical storage locations.	Future: Enhancement to configure routing via GUI 6A: Storage management enhancement to permit operator to manually change physical archive used for ESDTs.
DADS0470	5A 6A Partial	The ECS DAAC at the EDC shall provide storage for the following Landsat 7 data: a. Level OR data b. Associated metadata and browse c. IGS metadata and browse d. Associated calibration and metadata e. Calibration updates and metadata f. Engineering Data	Future: item c is future - Electronic Ingest of IGS format 0 metadata (5P); IGS Browse and format 0 metadata from tape (6A).
DADS0491	5A 6A Future	The ECS shall provide the capability for an authorized operator to delete data products.	5A: delete from archive 6A: granule deletion administration The operator will be able to select products for deletion by ESDT short name, version, and temporal coverage or insert time range. At the operator's choice, the deletion shall include or exclude the inventory metadata (i.e., cause a physical delete or only a delete from archive). ECS will display the number of granules which have been selected for deletion, and prompt the operator for confirmation, after which the deletion will take place (i.e., there will be no time period during which the granule is only "logically deleted"). The SDSRV will enforce referential integrity constraints for any deletions of metadata (i.e., for a complete physical deletion, products need to be deleted in the correct order). Deletions will be logged in the application log.
DADS0525	6A Partial	The ECS shall accept from operators updates/cancellations of data order requests.	Future: SDSRV implementation of priorities (Updates are limited to priority changes)

L3 ID	Rel	L3 Text	Interpretation Text
DADS0690	6A Partial	The ECS shall support the prioritized retrieval and delivery of data based on the priority information specified in the data retrieval request.	Future: SDSRV implementation Implemented by means of the queue of Distribution Requests maintained by the DDIST, SDSRV and STMGT CI.
DADS0890	6A Future	The ECS shall generate distribution resource statistics consisting of: a. request number and user identification b. Media type and quantity	
DADS0160	6A Partial	The ECS shall receive from the EOC the following with associated metadata: a. Spacecraft history log (or subset of history log) b. Activity schedules	Current: Activity schedules (which are ingested at LaRC) Future: (6A) Spacecraft history log
DADS0170	5A 6A Partial	The ECS shall be capable of receiving from Landsat the following: a. L70R data sets b. Metadata c. Ancillary data d. Calibration data e. Engineering data	Future: Electronic ingest of IGS format 0 metadata (5P); IGS Browse and format 0 metadata from tape (6A); L7 engineering data from the MOC (6A)
DADS1085	6A Future	The ECS shall maintain a data access log.	
DADS1110	6A Future	The ECS shall maintain a data distribution log.	
DADS1114	6A Future:	The ECS shall maintain a log of staging activity.	
DADS1375	6A Partial	The ECS shall support management and copying/refresh of archive media.	
DADS1450	6A Future	The ECS shall, upon detection that L0 data has been lost, generate a request for a replacement product from EDOS, dispatch the request, and ingest the replacement product.	Detection of missing archive holdings occurs only when an attempt is made to retrieve data in response to a Data Request. The request for a replacement product is performed by the operations staff. An operations script will be required to generate the PDR and transfer data to the appropriate directory.
DADS2307	6A Future	The ECS shall fulfill requests for L0 data from EDOS with L0 or L1A data, as available.	This is supported via D3 media transfer. This requirement is in the process of being updated by ESDIS to remove the option for L1A data.
DADS2440	6A Partial	The ECS shall distribute data under a multi-level priority system.	Future: SDSRV implementation
DADS2460	6A Partial	The ECS shall have a manual override function capable of altering the priority of a distribution request.	Future: SDSRV implementation. The operations staff will have the capability to change the priority of a queued Distribution Request.
DADS2490	6A Partial	The ECS shall have the capability to distribute data on the following approved high density storage media: a. 8 mm tape b. CD ROM c. DLT d. D3 tape	Current: 8mm Future (5B): D3 Future(6A): CD, DLT

L3 ID	Rel	L3 Text	Interpretation Text
DADS2950	6A Future	The ECS archive media shall be capable of being manually mounted at each DAAC, in case of failure of the automated system.	Only at the sites with more than one instance of the Archive Hardware (more than one robotic installation. A volume group will be exported from AMASS, manually removed and imported into a second instance of the Archive Hardware, where the media can be mounted and read. AMASS capability exists currently, but ESDT capability to change the Hardware designation must be added.
DADS3105	5A 6A Future	The ECS shall be capable of ingesting and archiving data in support of external data production at the data rate specified in the SIPS ICD.	5A: AM-1 Data Rates 6A: Aqua Data Rates
EOSD5010	6A Future	The ECS shall provide a machine-to-machine gateway for data retrieval by external sources at rates as specified in the SIPS ICD.	
IMS-0785	6A Future	ECS shall allow users to request a compression format in which ECS archival data formats are to be distributed.	Data compression formats currently identified as Unix and GZIP.
IMS-1072	6A Future	The ECS shall provide the capability for users to construct a standing Product Processing Order associated with a Data Acquisition Request.	
PGS-0200	5B 6A 6B Partial	The ECS shall execute Science Software in accordance with the Production Rules specified by the responsible instrument team	Most of the production rules listed below have been identified to support execution of specific PGEs. Some Instrument Teams have not yet identified all of the production rules that will be required to execute their PGEs. As these Production Rules and those for CHEM-1, and Aqua are identified, they will be added to this list and evaluated against the Production Rule budget in Option A+ for additional cost consideration. All supported Production Rules will be identified in individual L4 requirements. Current: a-s (a, b, c, d, e, f, g, h, I, j, k, l, m, n, o, p, q, r, s) Future: t-aa (t, u, v, w, x, y, z, aa) Where the currently identified Production Rules are: a. Basic temporal b. Advanced temporal c. Boundary offset d. Orbit-based activation f. Alternate ancillary inputs i. Spatial query l. Metadata-based query for input granules n. Minimum number of granules p. Runtime parameters q. Runtime parameter flag r. Accessing 1-233 path number t. Optional DPRs u. Most rec
PGS-1320	6A	The ECS shall support the planning and execution of up to 4,000 PGEs per day at any given DAAC.	

L3 ID	Rel	L3 Text	Interpretation Text
SDPS0092	5B 6A Future	The ECS shall provide an interface as defined in the SIPS ICD for supporting external production and reprocessing of standard ECS products.	Future: Provided through SIPS ingest interface and machine-to-machine gateways. 5B: Aqua Ingest 6A: Machine to machine
SDPS0150	6A Partial	The ECS shall assign priority and distribute expedited data and expedited data availability notices.	Future: SDSRV to implement queue workoff by priority

Table B-2. IRD Requirements

IRD ID	Rel	IRD Text	Interpretation Text
LAND-0090	6A	The IGSs shall have the capability to send and the ECS shall have the capability to receive inventory metadata for Landsat 7 IGS data.	
LAND-0100	6A	The IGSs shall have the capability to send and the ECS shall have the capability to receive browse data for Landsat 7 IGS data.	
SIPS0110	6A	The SIPS shall have the capability to provide and the ECS shall have the capability to receive data search and acquisition requests for EOS Standard Product reprocessing.	
SIPS0120	6A	The ECS shall have the capability to provide and the SIPS shall have the capability to receive notification of data availability for EOS Standard Product reprocessing using an agreed protocol.	
SIPS0130	6A	The SIPS shall have the capability to provide and the ECS shall have the capability to receive acknowledgments of receipt of file transfers for EOS Standard Product reprocessing using an agreed protocol.	
SIPS0010	6A	The ECS shall have the capability to send and the SIPS shall have the capability to receive data for use in the SIPS Standard Product generation using an agreed file transfer protocol.	
LAND-0016	6A	The MOC shall send and ECS shall receive engineering data.	

Appendix C. Agenda for Reviews€

This appendix provides an agenda for each of the release customer reviews.

C.1 Preliminary Agenda for IRR

1. Overview
2. Requirements
   - Mission Requirements
   - ESDT Requirements
   - Capacity Requirements
   - Release Capabilities
3. Design
   - Development Overview
   - Operations Concepts
     - Requirements Summary
     - Design Changes
     - Key Drivers
     - Hardware / Software Changes
     - Interaction Diagrams
     - End User Interactions
     - DAAC Operations Impacts
   - COTS S/W Additions and Upgrades
4. Test Engineering, Transition, & Operating System Upgrades
5. Wrap-up/Summary
   - Release Schedule
   - GFE/GFI Identified for 5B
   - Risk Areas & Mitigation Strategy
   - Review of Open Actions

- Concluding Remarks

C.2 Preliminary Agenda for CSR€

1. Introduction and Agenda
2. 6A System Functionality
3. 6A Test Results/Status
4. Performance Verification Lab
5. Non-Conformance Report (NCR) Status
   -Liens Against 6A at CSR
6. Post-CSR Installation and Transition
7. ECS Support to Site Readiness
8. CDRL Documentation Summary
9. Functional Configuration Audit
10. Physical Configuration Audit
11. Concluding Remarks

C.3 Preliminary Agenda for SRA€

1. Introduction
2. 5B Capabilities Review
3. 5B Test Results Since CSR
4. 5B On-site Tests
5. Non-Conformance Delivered to Sites Since CSR
6. Future Maintenance Releases to 5B
7. Readiness for Transition
8. Panel Deliberations
9. Panel Report

Appendix D. Documentation€

Table D-1 provides the list of documentation associated with 6A Release.

Table D-1. List of 6A Documentation

CDRL	DID/ Approval	Title	Science Delivery Schedule
002	102/MG1	ECS Configuration Management Plan	1 wk prior to PMR- Completed Vol 1: Completed Vol 2: Completed after update to reflect ESDIS CM Plan
008	108/MG3	Logic Network Diagrams	Electronic access
009	109/MG3	Performance Measurement Status Reports	monthly
011	111/MG3	Monthly Progress Reports	monthly
013	113/MG3	Intermediate Bar Charts	Electronic access
015	115/MG3	3 Week Window Report	Electronic access
019	119/MG3	Contractor Cost Reporting – 533 Requirements	monthly
020	120/MG3	Monthly Contractor Manpower Reporting	15 working days following end of calendar month
146	222/MG3	COTS Life Cycle Cost Analysis	Semi annually on April 1 and October 1
039	219/SE2 (P), 219/SE1 (F)	Interface Requirements Documents	SIPS ICD Update for Machine-to-Machine Gateway: IRR + 6 Weeks
045	304/DV1	Segment Requirements Specification	Electronic delivery (VDB)
046	305/DV3 (P) 305/DV2 (F) 305/DV2 (U/D)	Segment/ Design Specifications	Preliminary: IRR Final: CSR – 2 Weeks
050	311/DV1	Database Design and Database Schema Specifications	Final: CSR – 2 Weeks
051	313/DV3 (P), 313/DV3 (F)	ECS Internal ICDs	Preliminary: IRR Final: CSR – 2 Weeks
057	326/DV3	Monthly Tabulation of Nonconformance	Electronic delivery
062	333/DV1	PGS Toolkit Users Guide for the ECS Project	CSR – 6 Months
069	409/VE1	ECS Science Acceptance Test Plan	Electronic delivery, IRR+1 Week
070	411/VE1	ECS Science Acceptance Test Procedures	Electronic delivery, IRR+5 Months

CDRL	DID/ Approval	Title	Science Delivery Schedule
071	412/VE2	ECS Science Acceptance Test Report	Electronic delivery, Preliminary: CSR + 2 Weeks, Final: SRA + 2 Weeks
081	506/PA3	Audit Reports	SRA + 30 Days
092	519/PA3	Maintainability Demonstration Test Reports	One time at completion of demonstration, within 1 month of demonstration
102	529/PA3	Malfunction/Failure Reports (MRs)	Electronic delivery
106	533/PA1	Responses to Problem Notices and Alerts	as required
107	534/PA1	Maintenance Records	on-going — available for review on request
108	535/PA1	Acceptance Data Package	SRA + 30 Days
111	603/OP1	Operational Readiness Plan	Limited to GSFC & EDC, Launch -8 months
115	608/OP1	ECS Operations Plan	Each calendar year
116	609/OP1	Operations Tools Manual	Preliminary: IRR Final: CSR – 2 Weeks
117	611/OP3	Mission Operations Procedures	CSR – 2 Weeks
129	625/OP3	Training Material	Electronic delivery, CSR – 2 Weeks
143	714/PP3	Presentation Package	IRR + 2 Weeks CSR + 2 weeks SRA + 2 weeks
147	334/DV1	Science System Release Plan	Per master schedule
148	335/DV2	COTS (hardware and software) Deployment Plan	Submit a minimum of 6 months prior to deployment of COTS

Appendix E. Schedule€

This Appendix provides the schedule of major milestones for defining requirements, designing, developing, testing, and delivering 6A system. The CSR is planned for 30 March 2001. Any unplanned refinements of these capabilities required for Aqua launch will be delivered as patches to Release 5B. Release 6A provides performance enhancements necessary to support full Aqua operations. Release 6A is planned to be operational by the end of July 2001 which will be in time to support full Aqua operations. Figure E-1 provides the high level schedule for 6A major activities.

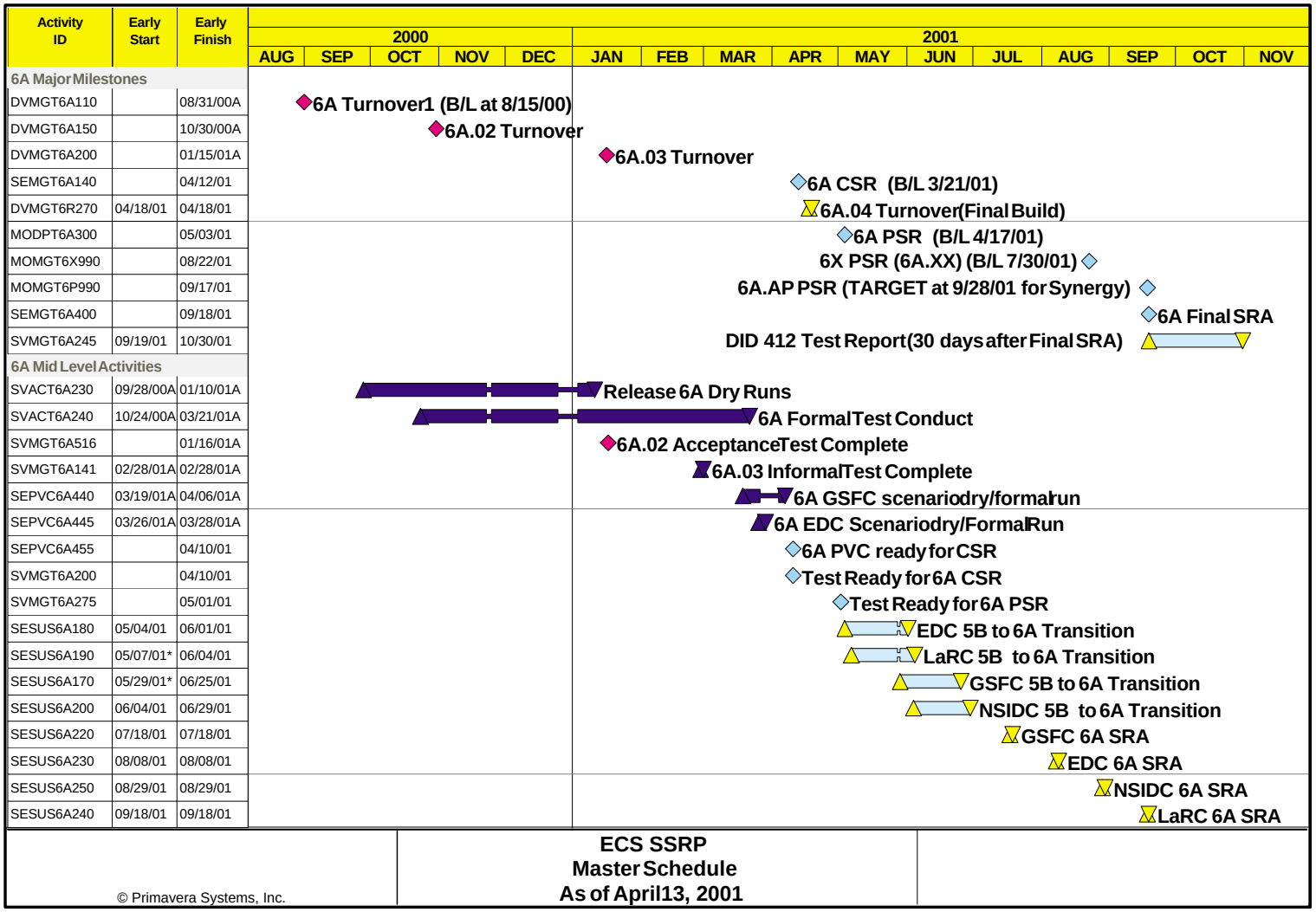

Figure E-1. Release 6A Schedule